Fig.1(a)

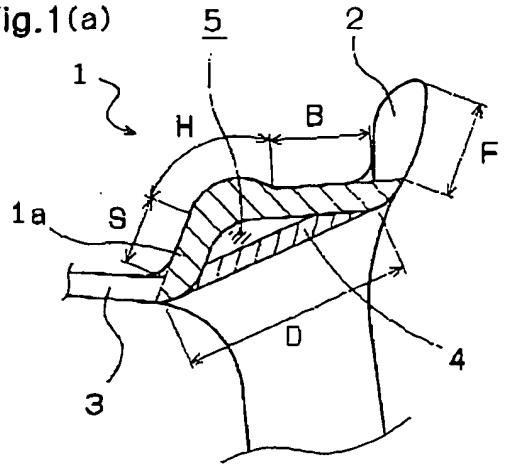


Fig.1(b)

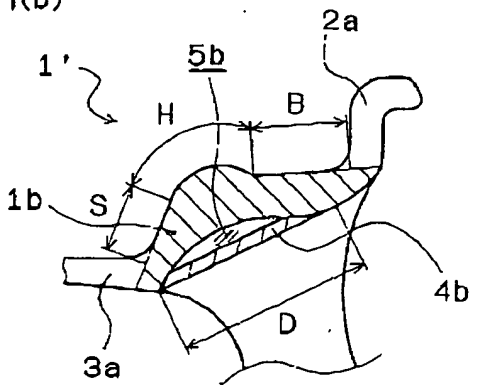


Fig.2

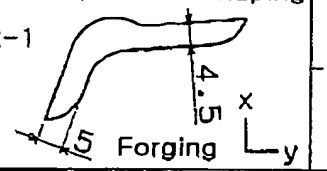
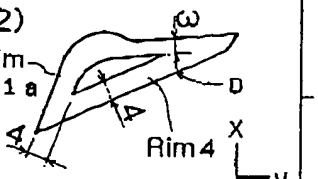
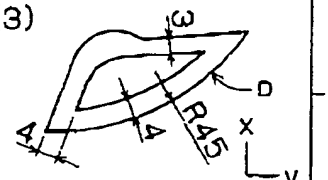
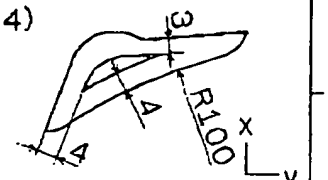
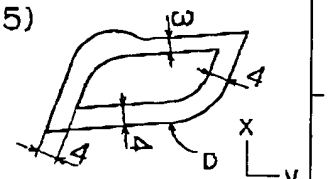
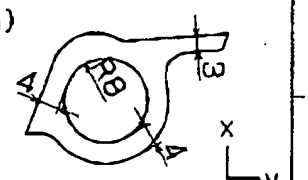
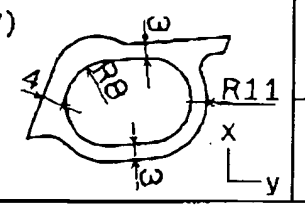
Cross-sectional shaping	Geometrical moments of inertia (mm⁴)	Aerial size of cross section (mm²)
Conventional shaping 2-1 	I x-x 31,512.2 (100%) I y-y 7,098.8 (100%)	247.6 (100%)
(2) Rim 1a 	I x-x 32,192.7 (102%) I y-y 8,797.28 (124%)	305.6 (123%)
(3) 	I x-x 43,122.5 (137%) I y-y 15,053.6 (212%)	345.2 (139%)
(4) 	I x-x 29,083.1 (92%) I y-y 7,608.4 (107%)	287.1 (116%)
(5) 	I x-x 52,124.1 (165%) I y-y 17,528.8 (247%)	364.6 (147%)
(6) 	I x-x 35,362.8 (112%) I y-y 22,723.6 (320%)	365.1 (147%)
(7) 	I x-x 50,266.7 (160%) I y-y 22,639.4 (319%)	354.9 (143%)

Fig.3

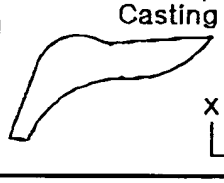
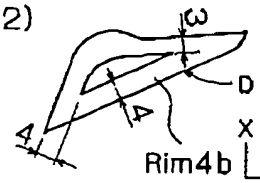
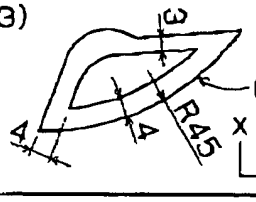
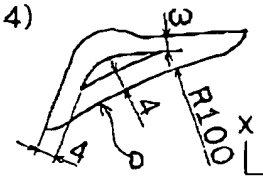
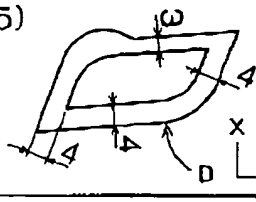
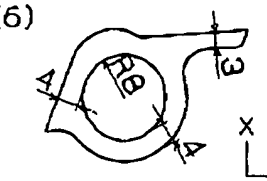
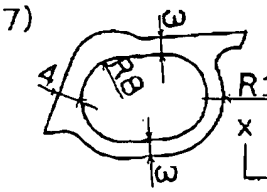
Cross-sectional shaping	Geometrical moments of inertia (mm⁴)	Aerial size of cross section (mm²)
Conventional shaping Casting 3-1 	I x-x 38,268.0 (100%) I y-y 14,054.8 (100%)	371.5 (100%)
(2) 	I x-x 32,192.7 (84%) I y-y 8,797.28 (63%)	305.6 (82%)
(3) 	I x-x 43,122.5 (113%) I y-y 15,053.6 (107%)	345.2 (93%)
(4) 	I x-x 29,083.1 (76%) I y-y 7,608.4 (54%)	287.1 (77%)
(5) 	I x-x 52,124.1 (136%) I y-y 17,528.8 (125%)	364.6 (98%)
(6) 	I x-x 35,362.8 (92%) I y-y 22,723.6 (162%)	365.1 (98%)
(7) 	I x-x 50,266.7 (131%) I y-y 22,639.4 (161%)	354.9 (96%)

Fig.4

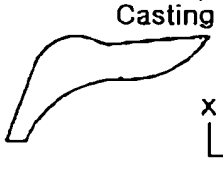
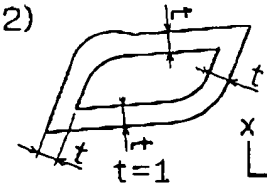
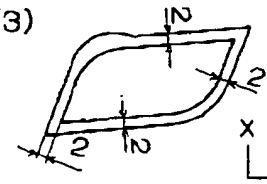
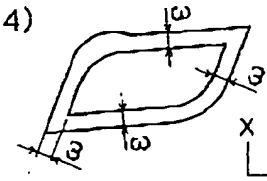
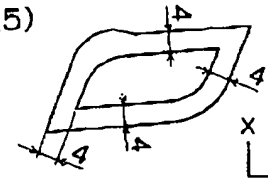
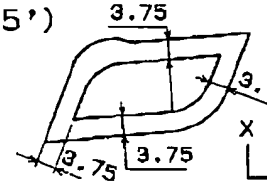
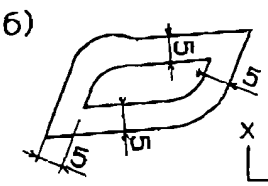
Cross-sectional shaping	Geometrical moments of inertia (mm^4)	Aerial size of cross section (mm^2)
Conventional shaping Casting 3-1 	I x-x 38,268.0 (100%) I y-y 14,054.8 (100%)	371.5 (100%)
(2) 	I x-x 19,711.4 (52%) I y-y 8,050.8 (57%)	125.3 (34%)
(3) 	I x-x 34,821.2 (91%) I y-y 12,899.5 (92%)	223.8 (60%)
(4) 	I x-x 45,708.5 (119%) I y-y 16,168.0 (115%)	310.5 (84%)
(5) 	I x-x 53,876.1 (141%) I y-y 18,346.4 (131%)	391.3 (105%)
(5') 	I x-x 51,910.5 (136%) I y-y 17,875.1 (127%)	371.2 (100%)
(6) 	I x-x 59,806.5 (156%) I y-y 19,703.0 (140%)	462.0 (124%)

Fig.5

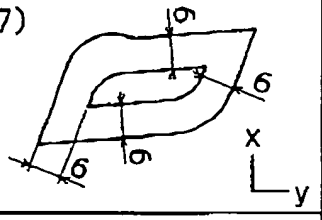
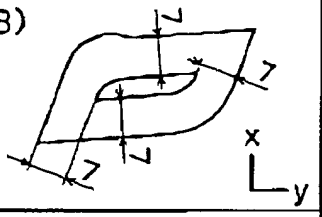
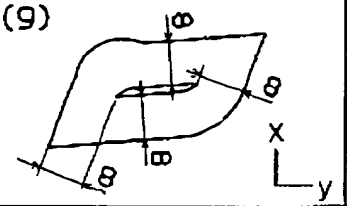
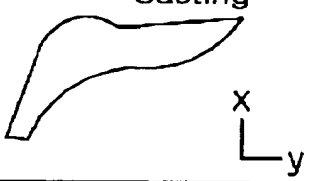
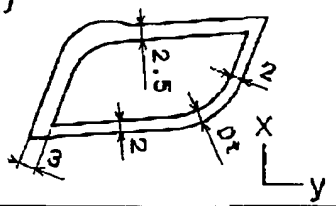
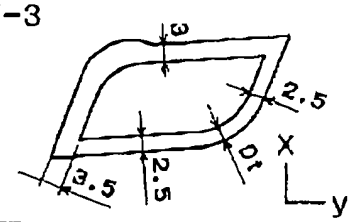
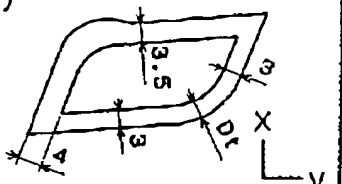
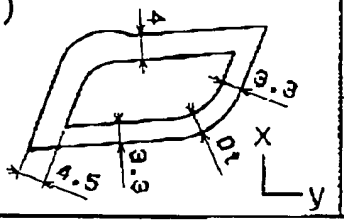
Cross-sectional shaping	Geometrical moments of inertia (mm⁴)	Aerial size of cross section (mm²)
(7) 	I x-x 64,232.0 (168%) I y-y 20,479.2 (146%)	525.2 (141%)
(8) 	I x-x 67,043.7 (175%) I y-y 20,852.2 (148%)	579.5 (156%)
(9) 	I x-x 68,600.2 (179%) I y-y 20,988.3 (149%)	623.5 (168%)

Fig.6

Wall thick -ness	Ix-x	Iy-y	Aerial size of section S	Ix-x/S	Iy-y/S
t=1	19711.4	8050.8	125.3	157.3	64.3
t=2	34821.2	12899.5	223.8	155.6	57.6
t=3	45708.5	16168.0	310.5	147.2	52.1
t=4	53876.1	18346.4	391.3	137.7	46.9
t=5	59806.5	19703.0	462.0	129.5	42.6
t=6	64232.0	20479.2	525.2	122.3	39.0
t=7	67043.7	20852.2	579.5	115.7	36.0
t=8	68600.2	20988.3	623.5	110.0	33.7

Fig.7

Cross-sectional shaping	Geometrical moments of inertia (mm⁴)	Aerial size of cross section (mm²)
Conventional shaping Casting 3-1 	I x-x 38,268.0 (100%) I y-y 14,054.8 (100%)	371.5 (100%)
(2) 	I x-x 39,197.2 (102%) I y-y 13,942.5 (99%)	254.8 (69%)
7-3 	I x-x 44,507.1 (116%) I y-y 15,562.6 (111%)	298.2 (80%)
(4) 	I x-x 49,112.3 (128%) I y-y 16,890.7 (128%)	339.5 (91%)
(5) 	I x-x 52,362.6 (137%) I y-y 17,770.6 (126%)	371.3 (100%)

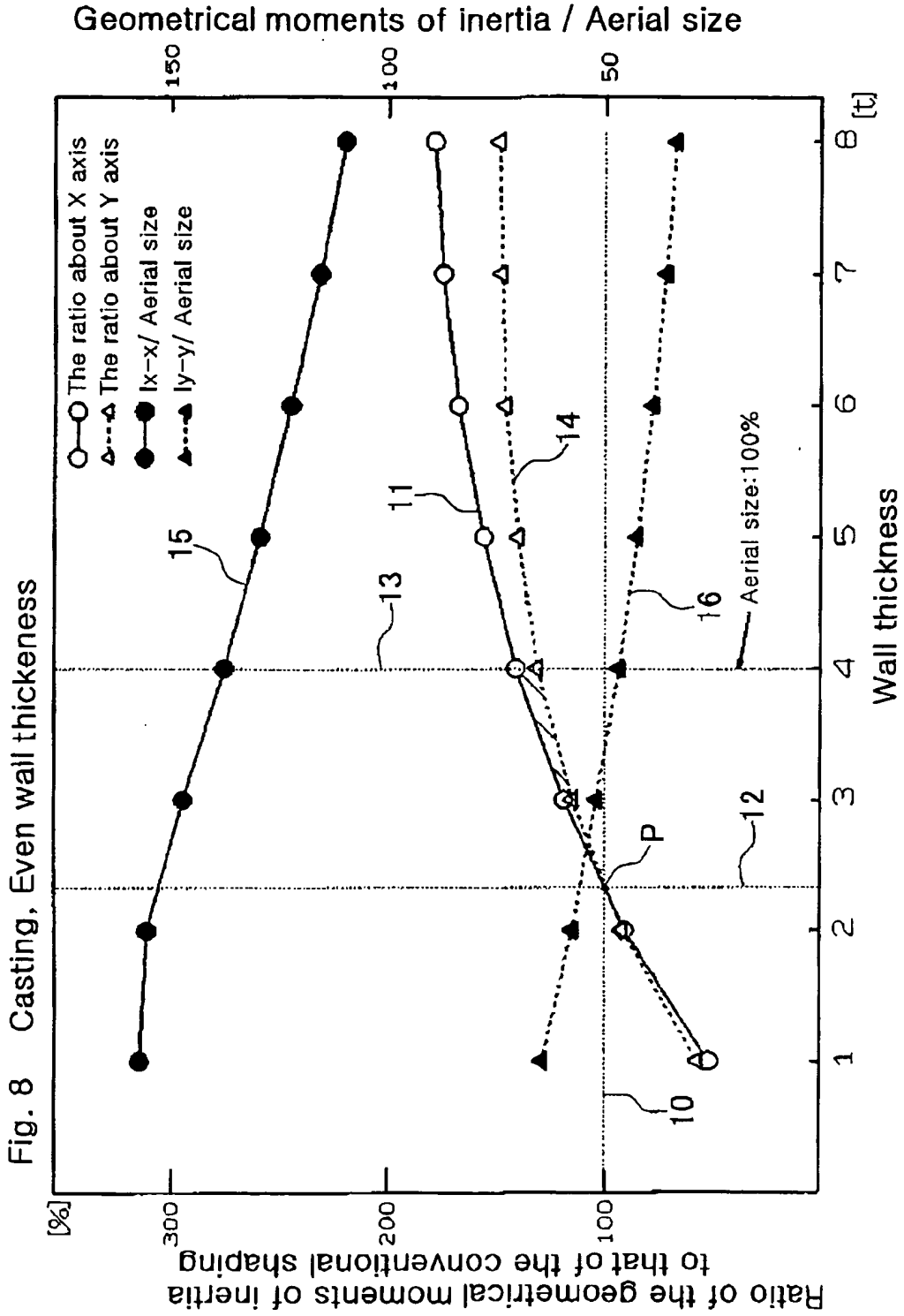


Fig. 8 Casting, Even wall thickness

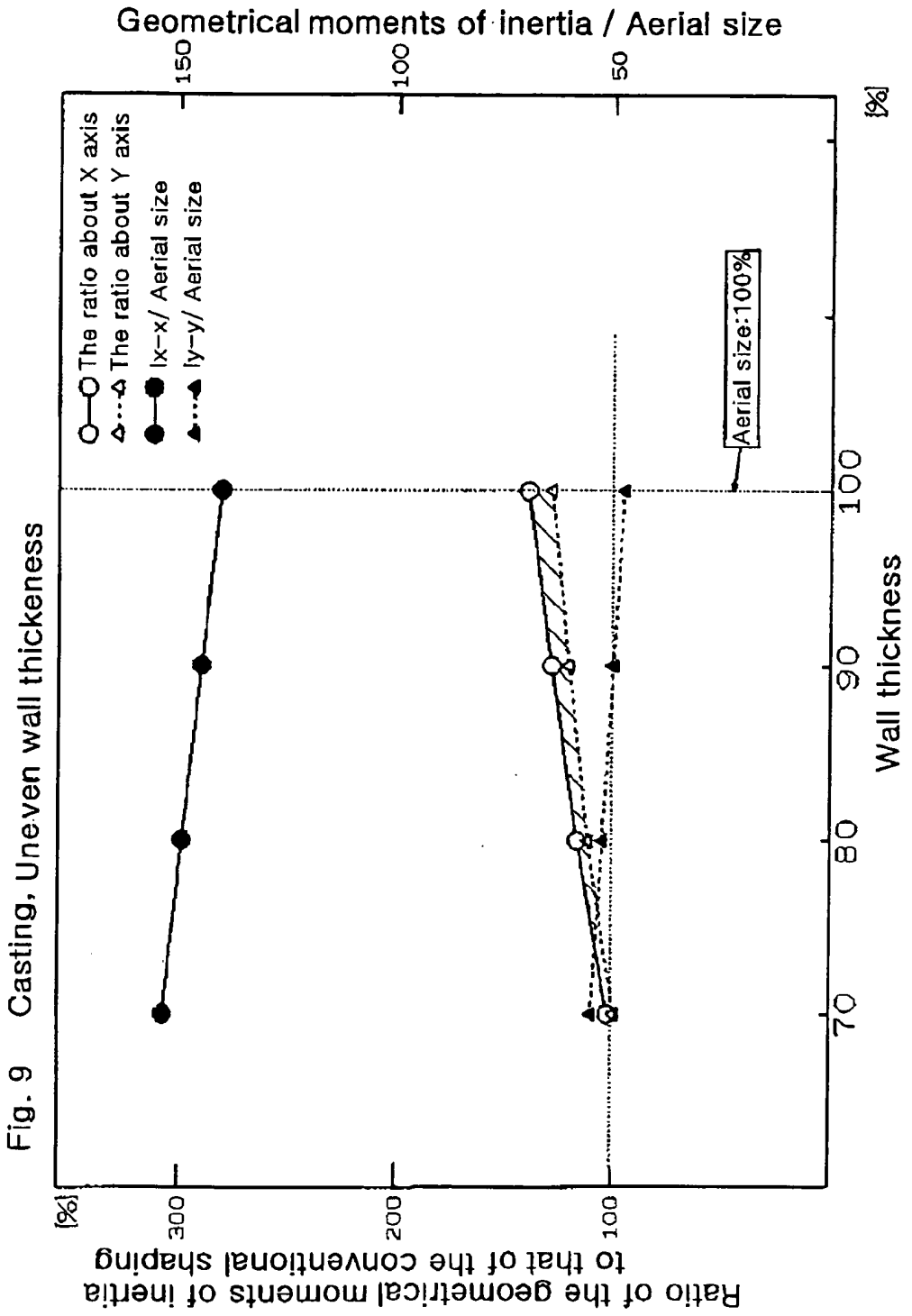

Geometrical moments of inertia / Aerial size
150
100
50
[%]
The ratio about X axis
The ratio about Y axis
Ix-x/ Aerial size
Iy-y/ Aerial size
Aerial size:100%
Casting, Uneven wall thickness
Wall thickness
70
80
90
100
[%]
300
200
100
Ratio of the geometrical moments of inertia
to that of the conventional shaping

Fig. 9

Fig. 10

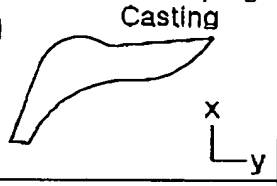
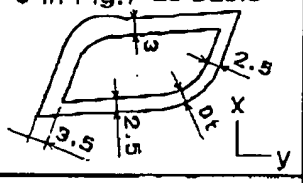
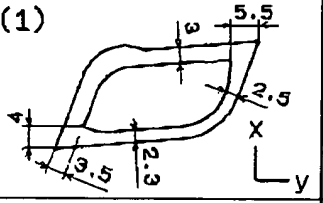
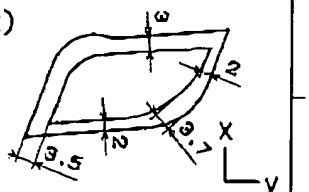
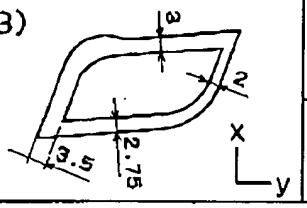
Cross-sectional shaping	Geometrical moments of inertia (mm⁴)	Aerial size of cross section (mm²)
Conventional shaping Casting 3-1 	I x-x 38,268.0 (100%) I y-y 14,054.8 (100%)	371.5 (100%)
7-3 in Fig.7 as basic 	I x-x 44,507.1 (116%) I y-y 15,562.6 (111%)	298.2 (80%)
(1) 	I x-x 45,706.5 (119%) I y-y 15,665.3 (111%)	298.4 (80%)
(2) 	I x-x 44,472.3 (116%) I y-y 15,117.2 (108%)	298.2 (80%)
(3) 	I x-x 43,636.6 (114%) I y-y 15,747.6 (112%)	298.2 (80%)

Fig.11(a)

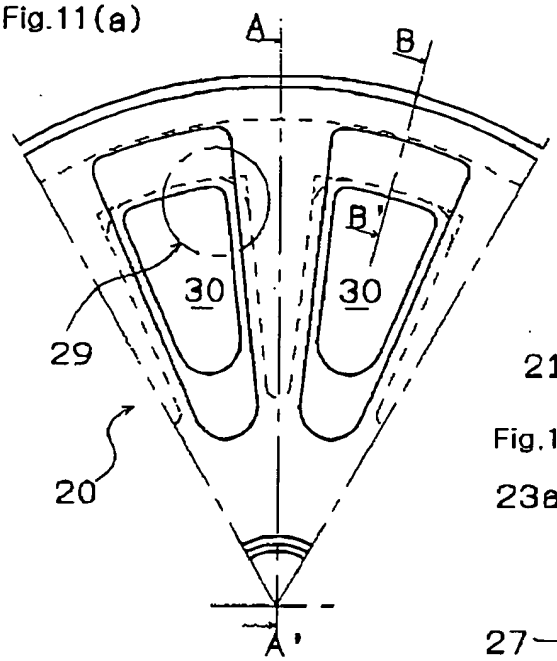


Fig.11(b)

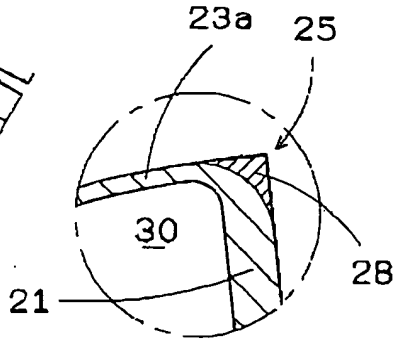


Fig.11(c)

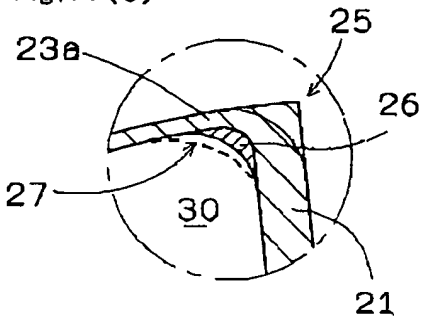


Fig.11(d)

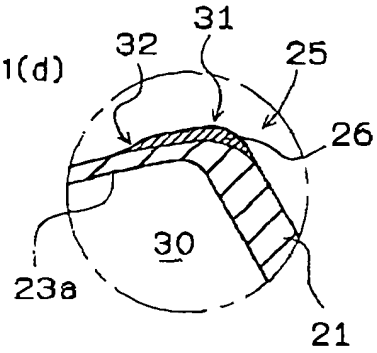


Fig.11(e)

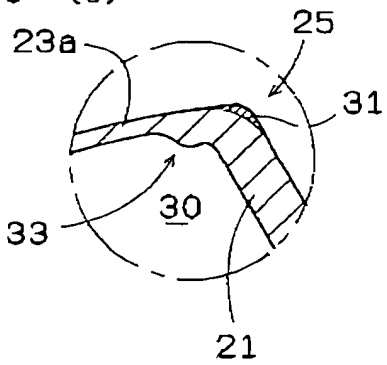
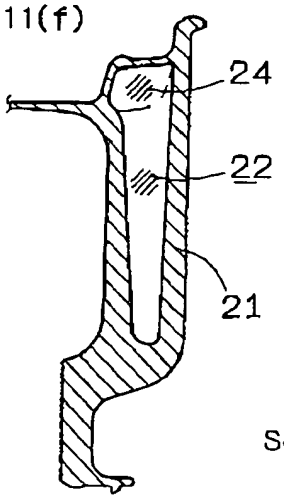
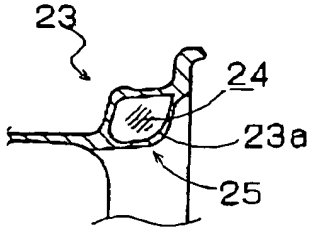


Fig.11(f)



Section along A–A' line

Fig.11(g)



Section along B–B' line

Fig. 12(a)

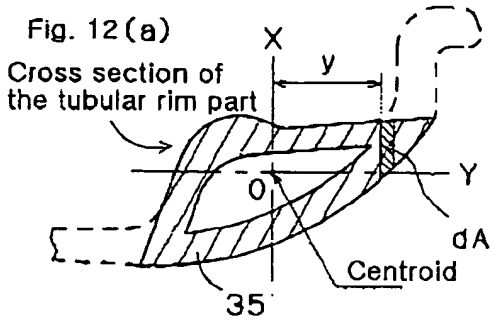


Fig. 12
(b)

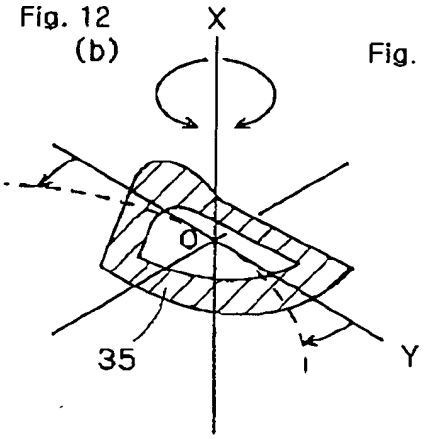


Fig. 12(c)

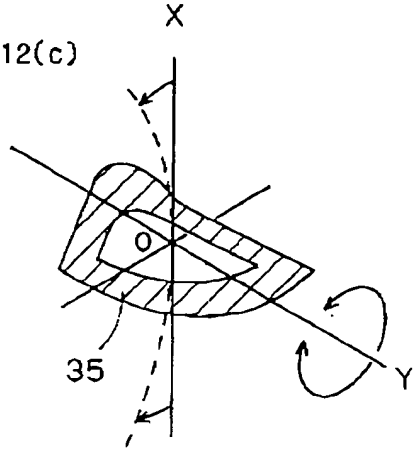


Fig. 13

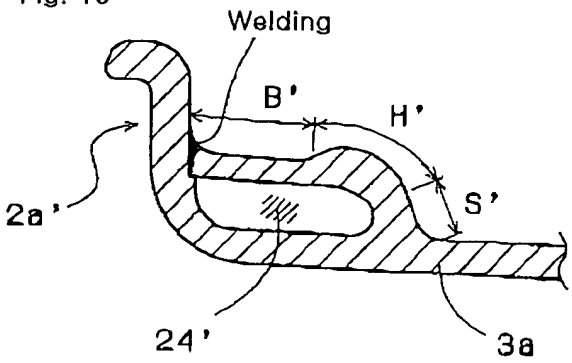


Fig.14(a)

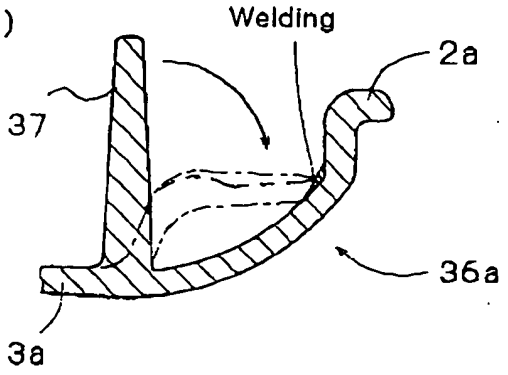


Fig.14(b)

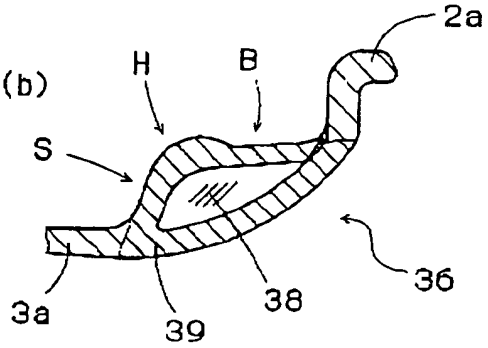


Fig.15